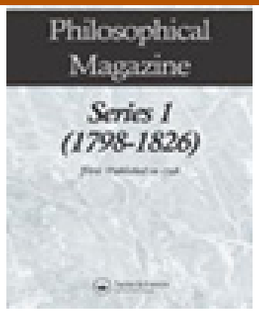

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LXVIII. *Observations suggested by the Geological Paper of Mr.* JOHN FAREY *in last Month's Philosophical Magazine.*

To MR. TILLOCH,—SIR,

THE geological facts communicated by Mr. John Farey, in his Paper commencing your last month's Number, are in an eminent degree instructive and interesting. It is only from the itinerant geologist cautiously pacing over various and extensive districts, and marking, with experienced intelligence, the wonderful phænomena which every where present themselves, that we can hope to obtain that accumulation of practical facts which can alone guide us to a sober and correct theory of the natural causes which, at remote periods, have operated those stupendous changes which are every where seen on and near the surface of our globe.

The almost infinitely diversified exterior of the earth, and its universal stratification, furnish the most interesting subjects of inquiry; and every natural inequality upon, and every bed which reposes beneath, the surface is connected with a history which well merits, and can only be developed by, the researches of the strongest intellect. Indeed the common mind is overpowered by the stunning magnitude of geological facts; it shrinks from the bold but just conclusion, that the lowest stratum which the deepest excavations into the earth have yet reached, was once itself a surface, and that the highest peak of the loftiest stratified mountain is only the remaining speck of a vast country which once spread itself out on the same, and in many instances much higher, level: the mountain deriving its present form and exaltation, not from masses of matter successively piled up by unknown means, but solely from the superior durability of its materials, which have withstood the operation of those tremendous agents, that have swept away the surrounding country in which it was imbedded, leaving the mountain itself a magnificent land gauge, by which to estimate the immensity of the tracts that have disappeared. The formation of mountains in this way, and that of the extensive strata of the earth, mutually elucidate each other. The

incalculable masses of materials necessary to form the latter, could only bo derived from the destructive transportation of other strata equally extensive; and the present elevation of stratified mountains is demonstrative evidence of the former existence of the countries which, in disappearing, have furnished such vast masses of diversified material for the formation of other stratified countries in other situations. These simple and sublime geological truths, however they may now shock minds unaccustomed to the contemplation of natural grandeur, will, at no distant period, be as generally assented to as the gravitation of Newton.

The just appreciation of geological phænomena is amongst the most creditable things of modern science. Already are the *ignes fatui* of hypothetical invention disappearing, and we no longer hear of seas fourteen thousand feet above the level of the present ocean retiring into cavernous receptacles, or of the exaltation of continents, to equal heights, by vulcanian energies. Forged in the same fabulous workshop, they are already slumbering on the same shelf with the vitreous sparks of Buffon.

The great source, I conceive, of all hypothetical reasoning on the formation of the earth arises from the mistaken opinion, that the present laws of nature are insufficient to account for past effects; without duly considering, that the natural causes which are now operating changes on our globe have been in action millions of years, and that it is the almost infinite duration and variance of their action, rather than the apparent little which we can now perceive them performing, that will enable us to account for the stupendous effects which they have accomplished. The system-builder by a deluge, an internal fire, an external crust, the vicinity of an erratic planet, or some such fanciful creation, is for accomplishing, almost in an instant, that which, far more probably, required many thousands of years to effect; and it assuredly is a rigid attention to, or disregard of, the two important circumstances of time and agency, that marks the boundary line between fanciful hypothesis and genuine theory. When the investigator flies off in search of a cause which no longer exists, or no longer operates within the sphere

cphere of his inquiry, he is certainly indulging in hypothetical visions; but when he fairly generalizes, by some common agreement, a multitudinous class of acknowledged phænomena, and directly connects them with causes still in operation, he is developing a lucid theory which will enlighten and improve.

It is this departure from nature, by an assumption of extinct or imaginary causes, that has induced me to offer the present observations. The closet geologist may be expected to indulge himself in the creation of hypothetical phantoms; but that he who has had the great and instructive volume of Nature spread out before him, and, page after page, has read, in her indelible and expressive characters, the history of her magnificent transactions, should imagine her present energies unequal to her past performances, and that others must be sought for in lunar regions, forsooth, is at once matter of surprise and regret.

I apply this to Mr. Farey, but with the utmost deference for his practical knowledge. In any thing relating to effects which have taken place, and to practical facts resulting from extensive personal observation, he is clear, correct, and instructive; but the instant he attempts to develop cause, the genuine spirit of philosophy forsakes him, and he becomes bewildered in the unprofitable maze of hypothesis. Mr. Farey is evidently preparing to add one more inventive system to the many that have already so much retarded the progress of real knowledge, by the introduction of a non-existent satellite at some indefinite time, and from some indefinite region, whose near approach to the earth is to reverse the action of gravitation, and undulate or distort the upper strata into some or all of their present irregularities. Before further committing himself, it will be well for Mr. Farey to consider whether, by the promulgation of a hypothesis so utterly incongruous with all the present operating laws of Nature, he is not about to sacrifice much of that fair fame which his practical researches have so deservedly assigned him.

A system-builder, like a religious or political bigot, is ever a most irritable being, and to prick his favourite bubble

is to explode all his virulence: but I confidently trust that Mr. Farey will be found a distinguished exception to this, and that he will hail with approbation a liberal criticism which has solely in view the expulsion of error from his favourite pursuit, and the recalling of his attention within those sober limits which experience and observation so justly prescribe. A dwarf stationed on the shoulder of a giant can see further than the giant himself; and if I assume this visual preeminence, it is only to acknowledge the Colossus that supports me.

Certainly the great and most desirable desideratum in geology is to account, satisfactorily, for the original formation of all stratified countries; and when that has been clearly accomplished, all irregularities and anomalies in the strata themselves, which have hitherto been almost the only circumstances attended to, will be comparatively an easy attainment; for it is impossible to doubt that the same powerful agent, whatever it may be, that has given mobility and transportation to such massive and diversified materials, and has spread them out, on so gigantic a scale, over the face of the globe, must also be equal to their separation, disruption, denudation, excavation, and almost every other geological appearance which observation has discovered.

And I have only to advance one step further and add, that the only agent in nature, with which we are acquainted, and to whose action we can assign, with any colourable probability, all these extraordinary and stupendous effects, is *water*.

To this powerful and incessant operator allow but a sufficiency of duration, and a suitable diversity of fluctuating circumstance, and he will have a bold and arduous task to perform who shall undertake to advocate its limitation in geological efficacy. And here it is that I would more especially solicit the attention of Mr. Farey, by urging him to relinquish his aërial assistant, which does not untie, but clumsily cut, the Gordian knot, and substitute in its stead this simple and natural instrument, in which he will experience a power and pliability of action competent to the illustration of almost every geological phænomenon. It is, however,

however, I think, very unfortunate for Mr. Farey himself, that he either does not perceive, or is strangely indisposed to admit, the most obvious effects of water on the surface of the earth. A decisive and very singular proof of this is given in that most extraordinary and unphilosophical conclusion which he draws on the formation of valleys, and which unquestionably detracts, to an extent which he cannot be aware of, from his other acknowledged merits as an observing naturalist.

The action of water, in operating extensive changes on our earth, naturally divides itself into two distinct branches; those changes which are effected by streams of fresh water running over the surface, and those far more mighty exterior and interior changes which the ocean itself has accomplished, during the submersion of our present continents.

Were there any probability, Mr. Editor, that these cursory remarks of mine could merit a place in your most respectable repository of scientific knowledge, I would pursue the subject in two subsequent papers on both of these branches; first by investigating, circumstantially, the formation of all valleys through which streams are now running, and afterwards adverting to the diversity and magnitude of marine action. I am, sir,

your most obedient humble servant,

JOHN CARR.

Princes Street, Manchester,
May 13, 1809.

LXIX. *Introduction to the Study of Mineralogy.* By *M.* HAUY *.

IF the motives which invite us to cultivate a natural science were founded merely upon the interest which certain productions of themselves inspire, and upon what appears at first sight attractive, zoology and botany would seem to have a preponderance over mineralogy which would attract a greater number of admirers.

* This is a translation of M. Hauy's Preliminary Discourse to his celebrated Work on Mineralogy.